

BOTANY

Project title: Physiology of Thermotolerant Plants in Yellowstone Park

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Objective: To use flowering plants seemingly adapted to geothermally modified environments of Yellowstone as model organisms for the study of stress physiology mechanisms.

Findings: In 2001, individuals of the species *Dichanthelium lanuginosum* were collected from several study sites within YNP and used for both protein and genetic analyses. Two basic findings are as follows. First, the expression of at least two classes of heat shock proteins is detectable in root extracts from plants on warm soils. Secondly, preliminary genetic analyses suggest that sub-populations of plants may exist along soil temperature gradients within a relatively small area.

Project title: Birds, Bees, Butterflies, and Botany

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Objective: To teach the basics of botanical illustration following the conventions of scientific illustration.

Findings: N/A

Project title: Yellowstone Flora

Principal investigator: Ms. Jennifer Whipple

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Objective: The vascular plant flora of Yellowstone, even though investigated for approximately 120 years, is not completely known. The primary focus of this project is to improve the current knowledge of the flora of the park through in-depth collecting, especially of areas in the park that have not been previously studied. This includes inventory of the occurrence and range of native taxa and also involves the documentation of the arrival and spread of exotic species. In addition, collection of specimens for the Yellowstone herbarium will improve the value of the facility for both NPS personnel and outside researchers.

Findings: Ongoing inventory of vascular plants and collection for the Yellowstone National Park Herbarium (YELLO). Four species of vascular plants previously not reported as occurring within the park were discovered. One taxa, *Oxytropis deflexa* (Pall.) DC. var. *foliolosa* (Hook.) Barneby, is a native species that was located apparently for the first time within the park. The other three species, *Trifolium dubium* Sibthorp, *Ambrosia psilostachya* DC., and a *Cerastium* of which the correct identification is still pending, are all exotic taxa that have become recently established within the park. Additionally, a population of *Atriplex canescens* (Pursh) Nutt. was discovered in the park. Previous reports of this species were based on misidentifications or specimens that the material was so limited that a definitive identification was uncertain.

Project title: Evolution and Habitat Requirements of *Agrostis rossiae* Vasey, a Grass Endemic to Thermal Soils in Yellowstone National Park

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Objective: *Agrostis rossiae* ("Ross's Bentgrass") is a grass that is endemic to thermal areas in southern Yellowstone. Previous studies have shown that *Agrostis* species are able to rapidly differentiate into genetically distinct populations when specialized soil conditions are present. These genetic differ-

ences are maintained by strong natural selection despite continued cross-pollination between the populations. The goals of my study are as follows: 1) to use genetic markers to determine whether *A. rossiae* is a valid taxon that is distinct from other co-occurring *Agrostis* species and therefore worthy of special protection, 2) to determine the evolutionary history of *A. rossiae*, find its sister taxon (closest relative), and determine whether it is monophyletic, i.e. has evolved only one time or more than once in response to geothermal habitats, and 3) to determine its habitat requirements, discover which ecological factors are responsible for its restricted distribution.

Findings: With considerable help from the Yellowstone GIS lab, I have completed mapping of all known *A. rossiae* populations. Collection of field data (soil temperature, soil moisture, seed collection, other sampling) continues. These data are being used to design growth chamber experiments that are conducted at Tulane University. Genetic data collection should be completed by May 2002. The entire research project should be completed by December, 2002. For additional information send email to mtercek@tulane.edu or visit <http://agrostis.topcities.com>.

Project title: Vascular Flora of the Greater Yellowstone Area

Principal investigator: Mr. Erwin Evert
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Objective: To collect vascular plant specimens as vouchers for distribution maps to be included in the investigator's "Flora of the Greater Yellowstone Area."

Findings: Four species known previously in Yellowstone National Park only from one or two other locations: *Gymnosteris parvula*, Hayden Valley; *Carex brevior*, Seven Mile Hole; *Rubus acaulis*, one mile west of Cascade Lake; *Pyrola picta* var. *dentata*, Elephant Back Mountain.

Project title: Aspen Regeneration in Northern Yellowstone National Park

Principal investigator: Dr. William J. Ripple
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Objective: Our objective was to measure aspen regenerative success on YNP's northern range.

Findings: Based on trophic cascades theory, we hypothesized that wolves may displace elk from some areas of the northern range, thus allowing more robust aspen regeneration in areas of higher wolf presence. Using radio telemetry data on wolves, we assigned a probability of wolf presence in each of our sampled aspen stands. Permanent 1 x 20 m belt transects (plots) were established in the aspen stands, marked with both a metal identification tag on a large-stemmed aspen tree and nails in the ground at 3, 5, 10, and 20 m from the starting point.

Our second set of field data was collected from our 112 aspen plots during August of 2001. Aspen overstory density and diameter at breast height (DBH) were recorded. Sucker density, heights, and whether the suckers had been browsed the previous winter were recorded. The number of elk pellet groups was recorded for each plot. The generalized habitat type of each aspen stand was recorded using the categories of mesic upland steppe, xeric upland steppe, and wet meadow/riparian. The aspect, slope, elevation, and recent fire history of each stand were recorded. Findings from our previous field research were published in the December 2001 issue of *Biological Conservation*.